ER – ELECTRICIANS REGULATIONS EXAMINATION
MARKING SCHEDULE

Notes:

1. (1mark) means that the preceding statement/answer earns 1 mark.
2. This schedule sets out the expected answers to the examination questions. The marker can exercise their discretion and decide on the overall accuracy of any answer that is presented in the candidate's own words.
3. Symbols and terms - alternatives

Power	W or P
Voltage	V or E or U
Phase	Active

SECTION 1			*Marks*	*Reference*	*Marking notes*
Qu					
1	Electrical appliances designed and used for patient treatment.		(2 marks)	ESR 23(2)	
2	(a)	Any **one** of:	(1 mark)		
		0.5 s at its rated residual current.		ESR 24 (4)(a)(i)	
		0.15 s at 5 times its rated residual current.		ESR 24 (4)(a)(ii)	
	(b)	300 mA.	(1 mark)	ESR 24 (4)(b)	
3	Any **one** of:		(2 marks)		
	•	Falsely certifies any prescribed electrical work.		ESR 69(a)	
	•	Purports to certify prescribed electrical work when the certificate of compliance does not comply with the requirements of regulation 66(1).		ESR 69(b)	
	•	Issues a certificate of compliance that contains incorrect information.		ESR 69(c)	
	•	Issues a certificate of compliance in relation to particular prescribed electrical work when not authorised to certify that work.		ESR 69(d)	
4	A current warrant of electrical fitness		(2 mark)	ESR 77(1)	

SECTION 1			*Marks*	*Reference*	*Marking notes*
5	(a)	AS/NZS 3001.	(1 mark)	ESR 78(2)	
	(b)	AS/NZS 3004.2	(1 mark)	ESR 78(2)(a)	
6	Any **two** of:		(2 marks)		
	•	Socket-outlet final subcircuits.		AS/NZS 30000 1.5.6.3(a) 2.6.3.1(a)	
	•	Lighting final subcircuits.		AS/NZS 30000 1.5.6.3(a) 2.6.3.1(b)	
	•	Directly connected hand-held electrical equipment.		AS/NZS 30000 1.5.6.3(a) 2.6.3.1(c)	
7	Any **two** of:		(2 marks)		
	•	Be of a type having two screws.		AS/NZS 3000 2.9.4.2(i) 3.7.2.11(b)(i)	
	•	Be of a type having one screw with an outside diameter not less than 80% of the tunnel diameter.		AS/NZS 3000 2.9.4.2(ii) 3.7.2.11(b)(ii)	
	•	Be of a type having the conductor clamped by suitable ferrules or plates in direct contact with the conductor.		AS/NZS 3000 2.9.4.2: Note 3.7.2.11(b)(iii)	

SECTION 1		*Marks*	*Reference*	*Marking notes*
Qu				
8	Any **one** of:	(2 mark)		
	- Permanent cable marker signs shall be provided to indicate the point where cable enters or leaves a structure.		AS/NZS 3000: 3.11.4.6(a)	
	- Recorded on a plan, and the plan located at the switchboard from where the cable originates.		AS/NZS 3000: 3.11.4.6(b)	
9	Any **two** of: - Protective earthing conductors connecting exposed conductive parts as required. - Main earthing conductor. - Main earthing terminal, connection or bar. - MEN connection between the main earthing terminal, connection or bar and the supply neutral bar. - Earth electrode. - Equipotential bonding of extraneous conductive and other parts as required.	(2 marks)	AS/NZS 3000: 5.3.1	
10	- 6mm^2	(2 marks)	AS/NZS3000:5.3.3 Table 5.1	

SECTION 2		*Marks*	*Reference*	*Marking notes*
Qu				
11	Any **one** of:	(2 marks)		
	- Conductors of $10mm^2$ or less shall be solid conductors.		AS/NZS 3000 5.3.2.1.2(a)	
	- Minimum $16mm^2$ conductors shall be used for main earthing conductors.		AS/NZS 3000 5.3.2.1.2(b)	
	- Necessary care shall be taken to provide satisfactory terminations.		AS/NZS 3000 5.3.2.1.2(c)	
	- Necessary care shall be taken to prevent corrosion of the conductor.		AS/NZS 3000 5.3.2.1.2(d)	
	- Conductors shall not be installed underground or in damp conditions.		AS/NZS 3000 5.3.2.1.2(e)	
12	Any **one** of:	(2 marks)		
	- The conductor resistance shall not be greater than that for a copper earthing conductor.		AS/NZS 3000: 5.3.2.1.3	
	- The degree of corrosion shall not be inferior to other material suitable for the purpose.		AS/NZS 3000: 5.3.2.1.3	
13	Any **two** of: - Has not less than seven strands - Is support by means of suitable anchorages. - Has a nominal cross-sectional area of not less than $8.5mm^2$ - Has a resistance in accordance with the requirements of clause 5.3.3. - Is identified as an earthing conductor at each anchorage point or catenary support.	(2 marks)	AS/NZS3000 5.3.2.3(d)	

SECTION 2	*Marks*	*Reference*	*Marking notes*
Qu			
14 Any **two** of: • Sprinkler pipes • Pipes conveying gas • Pipes conveying water • Pipes conveying flammable liquid • Other conductive non-electrical service enclosures	(2 marks)	AS/NZS 3000 5.3.2.2	
15 • 1.8m	(2 marks)	AS/NZS 3000 5.3.6.3 (b)	

SECTION 3		*Marks*	*Reference*	*Marking notes*
Qu				
16	Any **two** of:	(2 marks)		
	- Switch-disconnectors (switch isolators)		AS/NZS 3000 2.3.2.2.1 Note	
	- Multi-pole or single-pole disconnectors (off load isolators)		AS/NZS 3000 2.3.2.2.1 Note (a)	
	- Plugs and socket outlets		AS/NZS 3000 2.3.2.2.1 Note (b)	
	- Fuses		AS/NZS 3000 2.3.2.2.1 Note (c)	
	- Links		AS/NZS 3000 2.3.2.2.1 Note (d)	
	- Special terminals that do not require the removal of a conductor		AS/NZS 3000 2.3.2.2.1 Note (e)	

SECTION 3		*Marks*	*Reference*	*Marking notes*
Qu				
17	Any **one** of:	(2 marks)		
	- Each individual occupier shall have ready access to an isolating switch or switches that isolate that occupier's portion of the electrical installation.		AS/NZS 3000: 2.3.3.3(b)	
	- Shall be mounted on a switchboard located either in the individual installation or within easy access from an entrance to the individual premises.		AS/NZS 3000: 2.3.3.3(b)	
	- Each separate domestic electrical installation forming part of a multiple electrical installation shall be provided with not more than one main switch for each separately metered supply.		AS/NZS 3000 2.3.3.2	
	- For each separate domestic electrical installation forming part of a multiple electrical installation where there is more than one separately controlled supply from a meter, a main switch for each of the separately controlled supplies shall be provided.		AS/NZS 3000 2.3.3.2	
18	The prospective touch voltage arising between simultaneously accessible conductive parts in the event of a fault between a live part and exposed conductive parts or a protective earthing conductor.	(2 marks)	AS/NZS 3000 1.5.5.3(a) 2.4.2	

SECTION 3		*Marks*	*Reference*	*Marking notes*
Qu				
19	Any **one** of:	(2 marks)		
	Shall not be capable of automatically reclosing.		AS/NZS 3000: 2.4.3	
	Devices with an automatic reclose function of the type that automatically verify the installation is satisfactory before the device recloses are permitted.		AS/NZS 3000: 2.4.3 Exception	
20	Any **one** of:	(2 marks)		
	Enclosed fuse-links complying with the appropriate Standard(s) in the AS 60269 series.		AS/NZS 3000: 2.4.3(a)	
	Miniature overcurrent circuit-breakers complying with AS/NZS 60898 or AS/NZS 3111.		AS/NZS 3000: 2.4.3(b)	
	Moulded-case circuit-breakers complying with AS 60947.2.		AS/NZS 3000: 2.4.3(c)	
	Fixed setting RCDs complying with AS/NZS 3190, AS/NZS 61008.1 or AS/NZS 61009.1.		AS/NZS 3000: 2.4.3(d)	
	Other devices with no automatic reclose function, having characteristics similar to any of the devices listed in items (a) to (d).		AS/NZS 3000: 2.4.3(e)	

SECTION 4		*Marks*	*Reference*	*Marking notes*
Qu				
21	Any **one** of:	(2 marks)		
	- Located so the switchboard and access to it is not obstructed by the structure or contents of the building or by fittings or fixtures within the building.		AS/NZS 3000: 2.9.2.2(a)	
	- Be provided with adequate space around the switchboards on all sides where persons are to pass to enable all electrical equipment to be safely and effectively operated and adjusted.		AS/NZS 3000: 2.9.2.2(b)	
	- There must be an unimpeded space of at least 0.6m around the switchboard.		AS/NZS 3000: 2.9.2.2(i)	
	- With the switchboard doors in any position.		AS/NZS 3000: 2.9.2.2(i)	
22	Any **one** of:	(2 marks)		
	- Located so the switchboard and access to it is not obstructed by the structure or contents of the building or by fittings or fixtures within the building.		AS/NZS 3000: 2.9.2.2(a)	
	- Be provided with sufficient exit facilities to enable a person to leave the vicinity of the switchboard under emergency conditions.		AS/NZS 3000: 2.9.2.2(c)	
	- Shall open in the direction of egress without the use, on the switchboard side of the door, of a key or tool.		AS/NZS 3000: 2.9.2.2	
	- Door that open into a passage shall be capable of being secured in the open position to prevent workers being inadvertently being pushed towards the switchboard.		AS/NZS 3000: 2.9.2.2	
	- Openings or doorways that are at least 0.75m wide by 1.98m high to allow persons necessary access to the switchboard room or enclosure.		AS/NZS 3000: 2.9.2.2(iii)	

SECTION 4		*Marks*	*Reference*	*Marking notes*
23	Any **one** of:	(2 marks)		
	• Designed so that the incoming neutral conductor cannot be inadvertently disconnected from the bar or link.		AS/NZS 3000: 2.9.4.3(b)	
	• Provided with a separate terminal for the incoming neutral conductor terminating at the switchboard.		AS/NZS 3000: 2.9.4.3(d)(i)	
24	Any **one** of:	(2 marks)		
	• It shall effectively isolate all active supply conductors from the circuit.		AS/NZS3000 2.3.2.2.1	
	• Shall be capable of withstanding an impulse voltage at the point of installation, or shall have an appropriate contact gap.		AS/NZS3000 2.3.2.2.1	
	• Not be able to falsely indicate that the contacts are open.		AS/NZS3000 2.3.2.2.1	
	• Shall clearly and reliably indicate the isolating position of the device.		AS/NZS3000 2.3.2.2.1	
	• Be designed and installed so as to prevent unintentional closure.		AS/NZS3000 2.3.2.2.1	
	• Be a device that disconnects all active conductors of the relevant supply.		AS/NZS3000 2.3.2.2.1	
	• Be readily available.		AS/NZS3000 2.3.2.2.1	
	• Where the device is a switching device, it shall be capable of being secured in open position.		AS/NZS3000 2.3.2.2.1	
	• All devices used for isolation shall be clearly identified to indicate the circuit or equipment that they isolate		AS/NZS 3000 2.3.2.2.2	
25	Any **one** of: • To prevent the submain protective earthing conductor from carrying load current. • The link is in the main MEN switchboard. • To prevent RF interference to telecommunication and electronic equipment connected to the installation.	(2 marks)	GK	

SECTION 5		*Marks*	*Reference*	*Marking notes*
Qu				
26	Any **one** of:	(2 marks)		
	- Conductors with black or light blue insulation used as active conductors.		AS/NZS 3000 3.8.2(a)	
	- Conductors with other than green, yellow, green/yellow, black or light blue insulation being used as neutral conductors.		AS/NZS 3000 3.8.2(b)	
	- Conductors within multi-core cables with other than green, yellow or green/yellow insulation used as earthing conductors.		AS/NZS 3000 3.8.2(c)	
27	It shall be acceptable to identify the portion of the screen from the point of separation of the cores to the conductor termination as an earthing conductor.	(2 marks)	AS/NZS 3000 3.8.3.1(b)	
28	(a) Any **one** of:	(2 marks)		
	- The low voltage cables shall be of a type providing the equivalent of double insulation.		AS/NZS 3000 3.9.8.3(a)	
	- All cables shall be insulated for the highest voltage present.		AS/NZS 3000 3.9.8.3(b)	
	- The low voltage cables shall be installed in a separate compartment having fixed and continuous barriers between compartments.		AS/NZS 3000 3.9.8.3(c)	
	(b) Any **one** of:	(2 marks)		
	- Separation is required to ensure that faults occurring on the low voltage system are not transferred into the extra-low voltage system.		GK	
	- To avoid any detrimental effects arising between circuits of an electrical installation operating at different voltages.		AS/NZS 3000: 3.9.8.1(c)	The answer must come from the preamble and part (c)

SECTION 5		*Marks*	*Reference*	*Marking notes*
Qu				
29	Any **one** of:	(2 marks)		
	- Of a type designed for such use.		AS/NZS 3000 3.10.3.7(a)	
	- Painted with light-coloured water-based acrylic paint.		AS/NZS 3000 3.10.3.7(b)	
	- Where a wiring system is, or may be, exposed to direct sunlight, either a wiring system suitable for the conditions, shall be selected and installed, or adequate shielding shall be provided, in accordance with clause 3.3.2.2.		AS/NZS 3000 3.3.2.11	

SECTION 6					*Marks*	*Reference*	*Marking notes*
Qu							
30	**Equipment**	**Load Group**	**Calculation**	**Load (A)**		AS/NZS 3000: Table C2, Column 3	
	8, 60W lights	A	8 x (60 ÷ 230) = 2.087		(1 mark)		
	10, 250W lights	A	10 x (250 ÷ 230) = 10.87		(1 mark)		
	30, 8W lights	A	30 x (8 ÷ 230) = 1.04		(1 mark)		
	16 m Track	A	16 x 0.5 = 8		(1 mark)		
			2.87 + 10.87 + 1.04 + 8 =	22	(1 mark)		
	10, single socket outlets	B(ii)	10 +1+20 = 31		(1 mark)		
	1 single socket outlet	B(ii)	1000 x (30 x 100) = 4000		(1 mark)		
	10, 10A double socket out lets	B(ii)	4000 ÷ 230 =	17.39	(1 mark)		
	1, 6 kw air conditioner	C	6000 ÷ 230 =	26.09	(1 mark)		
	Maximum demand			65.48	(1 mark)		
	The maximum demand can be between 63A and 68A						

SECTION 7		*Marks*	*Reference*	*Marking notes*
Qu				
31	- Starting and stopping the motor	(1 mark)	AS/NZS 3000: 4.13.1.1(a)	
	- Emergency stopping in accordance with clause 2.3.5	(1 mark)	AS/NZS 3000: 4.13.1.1(b)	
	- Isolating the motor for mechanical maintenance, in accordance with clause 2.3.6	(1 mark)	AS/NZS 3000: 4.13.1.1(c)	
32	Any **one** of:	(2 marks)		
	- The full load current of the motor.		AS/NZS 3000: 4.13.1.2(a)	
	- Shall be capable of safely interrupting the locked rotor or stall current of the motor.		AS/NZS 3000: 4.13.1.2	
	- In the absence of any specific information supplied by the manufacturer, the locked rotor current or stall current shall be taken as eight times the full load current for a.c. motors.		AS/NZS 3000: 4.13.1.2(i)	
	- In the absence of any specific information supplied by the manufacturer, the locked rotor current or stall current shall be taken as four times the full load current for d.c. motors.		AS/NZS 3000: 4.13.1.2(ii)	
33	Where unexpected restarting of a motor might cause danger, each electric motor shall be provided with means to prevent automatic restarting after stopping.	(2 marks)	AS/NZS 3000: 4.13.1.4 paragraph 1	

34	Any **one** of:	(2 marks)		
	• For motors associated with a fire protection service.		AS/NZS 3000: 4.13.3.2(a)	
	• Where the opening of the motor circuit could create a hazard.		AS/NZS 3000: 4.13.3.2(b)	
	• Overtemperature protective devices shall not be provided on fire-pump motors where the operation of such devices might reduce the operating time of the equipment under emergency conditions.		AS/NZS 3000: 7.2.9.3	
	• Submersible pumps in water having a rating not exceeding 2250W.		AS/NZS 3000: 4.13.3.2	
35	Motors rated above 370W	(1 mark)	AS/NZS 3000: 4.13.2	

SECTION 8		Marks	Reference	Marking notes
Qu				
36	Any **two** of:	(2 marks)		
	- The installation or maintenance of conductors used in the installation or part installation.		ESR 65(1)(a)	Any type of general or high risk prescribed electrical work is also acceptable
	- The installation or maintenance of fittings where the fittings are connected to or intended to be connected, to conductors used in the installation or part installation.		ESR 65(1)(b)	
	- General risk prescribed electrical work.		ESR 65(3)	
	- High risk prescribed electrical work.		ESR 65(4)	
37	Any **one** of:	(2 marks)		
	- Contain a statement confirming that the person issuing the certificate is satisfied that the prescribed electrical work has been done lawfully and safely.		ESR 66(1)(a)(i)	Any item from ESR 67(1), (2) or (3) is also acceptable
	- Contain a statement confirming that the person issuing the certificate is satisfied that the information in the certificate is correct.		ESR 66(1)(a)(ii)	
	- Provide the information required by regulation 67(1) and (2).		ESR 66(1)(b)	
	- Include in or on it the authentication mark, as specified in regulation 111B.		ESR 66(1)(c)	
	- Have attached to it a copy of any manufacturer's instructions, supplier declarations of conformity, and certified designs used in the course of the prescribed electrical work.		ESR 66(1)(d)	

SECTION 8		*Marks*	*Reference*	*Marking notes*
38	Any **two** of Prescribed electrical work on:	(2 marks)		
	- An installation.		ESR 74A(1AA)(a)	Any type of low, general or high risk prescribed electrical work is also acceptable
	- A part installation.		ESR 74A(1AA)(b)	
	- Any fitting that supplied an installation or a part installation with electricity.		ESR 74A(1AA)(c)	
39	Any **one** of:	(2 marks)		
	- The installation or part installation is safe to use, on the grounds that it is electrically safe and complies with these regulations.		ESR 74A(1)(a)	
	- Where the prescribed electrical work comprised the maintenance or alteration of, or the addition to, the installation or part installation, the work has not adversely affected any other part of the installation.		ESR 74A(1)(b)	
40	Any **one** of:	(2 marks)		
	- Once the installation is connected to the power supply.		ESR 74A(2)	
	- If prescribed electrical work is done without disconnecting the power supply, references in subclause (3)(e) to (g) to connection must be taken to be references to the completion of the work.		ESR 74A(3)	

SECTION 9		*Marks*	*Reference*	*Marking notes*
41	Any **one** of:	(2 marks)		
	- Installation not less than 1.8m above the ground, floor or platform.		AS/NZS 3000 4.5.1.1(i)	
	- Provision of a suitable guard for the lamp and its lampholder.		AS/NZS 3000 4.5.1.1(ii)	
	- The lampholder is incorporated in a luminaire.		AS/NZS 3000 4.5.1.1(iii)	
42	Shall be connected to the supply so the neutral conductor is connected to the outer contact.	(2 marks)	AS/NZS 3000 4.5.1.2	
43	Any **one** of:	(2 marks)		
	- To prevent excessive temperature rise of the luminaire and auxiliary equipment		AS/NZS 3000 4.5.2.3.1(a)	
	- To prevent the risk of fire from ignition of combustible materials.		AS/NZS 3000 4.5.2.3.1(b)	

SECTION 9		*Marks*	*Reference*	*Marking notes*
Qu				
44	• Any **one** of:	(2 marks)		
	• The installation of a luminaire designed and certified by the manufacturer as being suitable for operation in contact with combustible materials.		AS/NZS 3000 4.5.2.3.1(i)(A)	
	• The installation of a luminaire designed and certified by the manufacturer as being suitable for operation in contact with or enclosed/covered by thermal insulation material.		AS/NZS 3000 4.5.2.3.1(i)(B)	
	• The installation of a luminaire in combination with a barrier tested and classified in compliance with AS/NZS 5110 as being suitable for the installation conditions.		AS/NZS 3000 4.5.2.3.1(ii)	
	• The installation of a luminaire with separation from thermal insulating materials, combustible building elements and loose combustible materials not less than the minimum clearance specified by the manufacturer of the luminaire, which may require a barrier or guard constructed of fire resistant materials; or		AS/NZS 3000 4.5.2.3.1(iii)(A)	
	• The installation of a luminaire with separation from thermal insulating materials, combustible building elements and loose combustible materials not less than the default clearances as specified in figure 4.7, which may require a barrier or guard constructed of fire resistant materials.		AS/NZS 3000 4.5.2.3.1(iii)(B)	
	MORE ANSWERS FOR Q44 ON NEXT PAGE			

SECTION 9		*Marks*	*Reference*	*Marking notes*
Qu				
44	• Only recessed luminaires of Classes IC-F, IC, CA80 or CA 135, which are compliant with AS/NZS 60598.2.2, including NZ only amendment A, shall be installed in residential buildings).		AS/NZS 3000 4.5.2.3.4(a)	
	• All classes of recessed luminaire shall be spaced from other building elements as given in the luminaire manufacturer's instructions.		AS/NZS 3000 4.5.2.3.4(c)	
	• If no instructions are available, the default clearances shown in Figure 4.9 shall apply and a fixed guard constructed of rigid fire-resistant material may be required.		AS/NZS 3000 4.5.2.3.4(c)	
	• Clearances A 200 mm B 200 mm C 50 mm D 50 mm		AS/NZS 3000 Figure 4.7	
	• Clearances HCB 100 mm SCB 100 mm SCI 100 mm SCG 50 mm		AS/NZS 3000 Figure 4.9	
45	• 1m	(2 marks)	AS/NZS3000 4.5.2.2 Table 4.2	